

ENCLOSURE: TECHNICAL SUPPORT DOCUMENT FOR EPA CONCURRENCE ON O₃ EXCEEDANCES MEASURED IN THE PHOENIX-MESA 2008 8-HOUR O₃ NONATTAINMENT AREA ON JULY 7, 2017 AS EXCEPTIONAL EVENTS

On May 18, 2018, Arizona Department of Environmental Quality (ADEQ) submitted an exceptional event demonstration for exceedances of the 2008 8-hour ozone (O₃) National Ambient Air Quality Standards (NAAQS) that occurred at the Central Phoenix, Dysart, Glendale, Mesa, North Phoenix, Phoenix Supersite, Pinnacle Peak, South Phoenix, and West Phoenix monitoring sites on July 7, 2017.^{1,2} The demonstration submitted by ADEQ stated that the exceedances measured on July 7, 2017 were caused by multiple wildfires burning in the southeastern portion of Arizona, namely the Burro, Frye, and Hilltop fires.³ Under the Exceptional Events Rule, air agencies can request the exclusion of event-influenced data, and the EPA can agree to exclude these data from the data set used for certain regulatory decisions. The remainder of this document summarizes the Exceptional Events Rule requirements, the event, and the EPA's review process.

EXCEPTIONAL EVENTS RULE REQUIREMENTS

The EPA promulgated the Exceptional Events Rule (EER) in 2007, pursuant to the 2005 amendment of Clean Air Act (CAA) Section 319. In 2016, the EPA finalized revisions to the EER. The 2007 EER and 2016 revisions added 40 CFR 50.1(j)-(r); 50.14; and 51.930 to the Code of Federal Regulations (CFR). These sections contain definitions, criteria for EPA approval, procedural requirements, and requirements for air agency demonstrations. The EPA reviews the information and analyses in the air agency's demonstration package using a weight of evidence approach and decides to concur or not concur. The demonstration must satisfy all of the EER criteria for the EPA to concur with excluding the air quality data from regulatory decisions.

Under 40 CFR 50.14(c)(3)(iv), the air agency demonstration to justify exclusion of data must include:

- A. "A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s);"
- B. "A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation;"
- C. "Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times" to support requirement (B) above;

¹ "State of Arizona Exceptional Event Documentation for Wildfire-Caused Ozone Exceedances on July 7, 2017 in the Maricopa Nonattainment Area," (May 2018) ("demonstration").

² While submitted by ADEQ, the demonstration was developed through a joint effort by ADEQ, Maricopa Association of Governments, and Maricopa County Air Quality Department.

³ See demonstration, p. 1, 10.

- D. “A demonstration that the event was both not reasonably controllable and not reasonably preventable;” and
- E. “A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event.”⁴

⁴In addition, the air agency must meet several procedural requirements, including:

1. submission of an Initial Notification of Potential Exceptional Event and flagging of the affected data in the EPA's Air Quality System (AQS) as described in 40 CFR 50.14(c)(2)(i),
2. completion and documentation of the public comment process described in 40 CFR 50.14(c)(3)(v), and
3. implementation of any applicable mitigation requirements as described in 40 CFR 51.930.

For data influenced by exceptional events to be used in initial area designations, air agencies must also meet the initial notification and demonstration submission deadlines specified in Table 2 to 40 CFR 50.14 must be met. We include below a summary of the EER criteria, including those identified in 40 CFR 50.14(c)(3)(iv).

Regulatory Significance

The 2016 Exceptional Events Rule includes regulatory language that applies the provisions of CAA section 319 to a specific set of regulatory actions. As identified in 40 CFR 50.14(a)(1)(i), these regulatory actions include initial area designations and redesignations; area classifications; attainment determinations (including clean data determinations); attainment date extensions; findings of State Implementation Plan (SIP) inadequacy leading to a SIP call; and other actions on a case-by-case basis as determined by the Administrator. Air agencies and the EPA should discuss the regulatory significance of an exceptional events demonstration during the Initial Notification of Potential Exceptional Event prior to the air agency submitting a demonstration for the EPA's review.

Narrative Conceptual Model

The 2016 Exceptional Events Rule directs air agencies to submit, as part of the demonstration, a narrative conceptual model of the event that describes and summarizes the event in question and provides context for analyzing the required statutory and regulatory technical criteria. Air agencies may support the narrative conceptual model with summary tables or maps. For wildfire O₃ events, the EPA recommends that the narrative conceptual model also discuss the

⁴ A natural event is further described in 40 CFR 50.1(k) as “an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role. For purposes of the definition of a natural event, anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions.”

interaction of emissions, meteorology, and chemistry of event and non-event O₃ formation in the area, and, under 40 CFR 50.14(a)(1)(i), must describe the regulatory significance of the proposed data exclusion.

Clear Causal Relationship and Supporting Analyses

The EPA considers a variety of evidence when evaluating whether there is a clear causal relationship between a specific event and the monitored exceedance or violation. For wildfire O₃ events, air agencies should compare the O₃ data requested for exclusion with seasonal and annual historical concentrations at the air quality monitor to establish a clear causal relationship between the event and monitored data. In addition to providing this information on the historical context for the event-influenced data, air agencies should further support the clear causal relationship criterion by demonstrating that the wildfire's emissions were transported to the monitor, that the emissions from the wildfire influenced the monitored concentrations, and, in some cases, air agencies may need to provide evidence of the contribution of the wildfire's emissions to the monitored O₃ exceedance or violation.

For wildfire O₃ events, the EPA has published a guidance document that provides three different tiers of analyses that apply to the "clear causal relationship" criterion within an air agency's exceptional events demonstration.⁵ This tiered approach recognizes that some wildfire events may be more clear and/or extreme and, therefore, require relatively less evidence to satisfy the rule requirements. If a wildfire O₃ event satisfies the key factors for either Tier 1 or Tier 2 clear causal analyses, then those analyses are the only analyses required to support the clear causal relationship criterion within an air agency's demonstration for that particular event. Other wildfire/O₃ events will be considered based on Tier 3 analyses.

- **Tier 1:** Wildfires that clearly influence monitored O₃ exceedances or violations when they occur in an area that typically experiences lower O₃ concentrations.
 - *Key Factor:* seasonality and/or distinctive level of the monitored O₃ concentration. The event-related exceedance occurs during a time of year that typically has no exceedances, or is clearly distinguishable (e.g., 5-10 ppb higher) from non-event exceedances.
 - In these situations, O₃ impacts should be accompanied by clear evidence that the wildfire's emissions were transported to the location of the monitor.
- **Tier 2:** The wildfire event's O₃ influences are higher than non-event related concentrations, and fire emissions compared to the fire's distance from the affected monitor indicate a clear causal relationship.
 - *Key Factor 1:* fire emissions and distance of fire(s) to affected monitoring site location(s). Calculated fire emissions of nitrogen oxides (NO_x) and reactive-volatile organic compounds (VOC) in tons per day (Q) divided by the distance from the fire to the monitoring site (D) should be equal to or greater than 100 tons

⁵ "Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations" (September 2016).

per day/kilometers ($Q/D \geq 100$ tpd/km). The guidance document provides additional information on the calculation of Q/D.

- *Key Factor 2*: comparison of the event-related O₃ concentration with non-event related high O₃ concentrations. The exceedance due to the exceptional event:
 - is in the 99th or higher percentile of the 5-year distribution of O₃ monitoring data, OR
 - is one of the four highest O₃ concentrations within 1 year (among those concentrations that have not already been excluded under the Exceptional Events Rule, if any).
 - In addition to the analysis required for Tier 1, the air agency should supply additional evidence to support the weight of evidence that emissions from the wildfire affected the monitored O₃ concentration.
- Tier 3: The wildfire does not fall into the specific scenarios (i.e., does not meet the key factors) that qualify for Tier 1 or Tier 2, but the clear causal relationship criterion can still be satisfied by a weight of evidence showing.
 - In addition to the analyses required for Tier 1 and Tier 2, an air agency may further support the clear causal relationship with additional evidence that the fire emissions caused the O₃ exceedance.

Not Reasonably Controllable or Preventable

The EER requires that air agencies establish that the event be both not reasonably controllable and not reasonably preventable at the time the event occurred. This requirement applies to both natural events and events caused by human activities; however, it is presumed that wildfires on wildland will satisfy both factors of the “not reasonably controllable or preventable” element unless evidence in the record clearly demonstrates otherwise.⁶

Natural Event or Event Caused by Human Activity That is Unlikely to Recur

According to the CAA and the Exceptional Events Rule, an exceptional event must be “an event caused by human activity that is unlikely to recur at a particular location *or* a natural event” (emphasis added). The 2016 Exceptional Events Rule includes in the definition of wildfire that “[a] wildfire that predominantly occurs on wildland is a natural event.” Once an agency provides evidence that a wildfire on wildland occurred and demonstrates that there is a clear causal relationship between the measurement under consideration and the event, the EPA expects minimal documentation to satisfy the “human activity that is unlikely to recur at a particular location *or* a natural event” element. The EPA will address wildfires on other lands on a case-by-case basis.

⁶ A wildfire is defined in 40 CFR 50.1(n) as “any fire started by an unplanned ignition caused by lightning; volcanoes; other acts of nature; unauthorized activity; or accidental, human-caused actions, or a prescribed fire that has developed into a wildfire. A wildfire that predominantly occurs on wildland is a natural event.” Wildland is defined in 40 CFR 50.1(o) as “an area in which human activity and development are essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered.”

EPA REVIEW OF EXCEPTIONAL EVENTS DEMONSTRATION

On March 27, 2018, ADEQ submitted an Initial Notification of Potential Exceptional Event for exceedances of the 2008 8-hour O₃ National Ambient Air Quality Standards (NAAQS) that occurred at Central Phoenix, Dysart, Glendale, Mesa, North Phoenix, Phoenix Supersite, Pinnacle Peak, South Phoenix, and West Phoenix monitoring sites within the Phoenix-Mesa, AZ nonattainment area for the 2008 8-hour O₃ NAAQS (hereafter “nonattainment area”) on July 7, 2017.⁷ On May 18, 2018, ADEQ submitted the demonstration for these exceedances.

Regulatory Significance

The EPA determined that data exclusion of the exceedances may have regulatory significance for attainment by the Moderate area attainment date for this nonattainment area, and worked with ADEQ to identify the relevant exceedances and monitoring sites affected.⁸ Table 1 summarizes the exceedances that ADEQ included in the demonstration.

Table 1: EPA 2008 8-hour O₃ NAAQS Exceedance Summary

Exceedance Date	Monitor/Site Name	AQS ID	8-hour Avg. (ppm)
July 7, 2017	Central Phoenix	04-013-3002	0.078
July 7, 2017	Dysart	04-013-4010	0.087
July 7, 2017	Glendale	04-013-2001	0.079
July 7, 2017	Mesa	04-013-1003	0.078
July 7, 2017	North Phoenix	04-013-1004	0.085
July 7, 2017	Phoenix Supersite	04-013-9997	0.086
July 7, 2017	Pinnacle Peak	04-013-2005	0.077
July 7, 2017	South Phoenix	04-013-4003	0.077
July 7, 2017	West Phoenix	04-013-0019	0.084

Narrative Conceptual Model

The demonstration submitted by ADEQ provided a narrative conceptual model in Section II to describe how emissions from several fires in southeastern Arizona caused O₃ exceedances at Central Phoenix, Dysart, Glendale, Mesa, North Phoenix, Phoenix Supersite, Pinnacle Peak, South Phoenix, and West Phoenix monitoring sites. The narrative conceptual model included characteristics of the nonattainment area and surrounding areas, such as descriptions of typical O₃ formation, the ambient O₃ monitoring network, meteorology, geography, topography, emissions and seasonal O₃ variations.⁹

Section II also described event-related characteristics and included ADEQ’s claims that the observed exceedances were caused by emissions from multiple fires in southeastern Arizona and that these exceedances qualify as an exceptional event under the EER. The demonstration

⁷ See letter from Timothy Franquist, ADEQ, to Elizabeth Adams, EPA Region 9, dated March 27, 2018.

⁸ See letter from Gwen Yoshimura, EPA Region 9, to Timothy Franquist, ADEQ, dated May 8, 2018.

⁹ See demonstration, p. 6-10.

included a summary of the event, stating that wildfires burned from July 1 through July 7, 2017 and that the wildfire emissions impacted the nonattainment area on July 7, 2017. The demonstration specifically identified the Burro, Frye, and Hilltop fires as the three fires that produced the most emissions, and provided a list of the actively burning wildfires in southeastern Arizona from July 1 through July 7, 2017 with information such as the start/end date, total acres burned and the fire perimeter in acres, along with a map of their locations.¹⁰

The demonstration also included a description of the general meteorological conditions that led to transport of wildfire emissions from the fires in southeastern Arizona to the nonattainment area and provided daily surface weather maps for July 6 through 8, 2017, showing a “Four Corners high” (i.e. a high pressure ridge over the Four Corners area, including northeastern Arizona) that weakened on July 7 and 8, resulting in a shift of the winds from out of the southwest to out of the southeast, and promoting vertical mixing of air aloft to the ground. The demonstration also provided smoke maps for July 1 through July 10, 2017, along with HYSPLIT back trajectories from the Phoenix Supersite monitor to further illustrate the fire locations and emissions, as well as the atmospheric transport leading up to and following the July 7, 2017 event.¹¹ The HYSPLIT trajectories show that from July 1 through July 5, 2017, the airflow was generally from the west and southwest. On July 6, 2017, the airflow direction, as indicated by the trajectories, began to shift towards coming from the east and southeast, where the wildfires were located. This shift continued on July 7 and 8, 2017, consistent with the weakening of the “Four Corners high” shown on the surface weather maps.

The demonstration presented daily 8-hour maximum O₃ concentrations for all O₃ monitoring sites in the nonattainment area between June 30 and July 14, 2017, in table and graph form. The demonstration also included a separate bar graph of daily 8-hour maximum O₃ concentrations for only the exceeding monitors between June 30 and July 14, 2017, and a diurnal profile of the exceeding monitors on July 7, 2017. The demonstration stated that O₃ and O₃ precursor emissions were transported from the wildfires to the nonattainment area after a shift in airflow patterns as described above. After this shift occurred, O₃ and O₃ precursor emissions were transported to the nonattainment area the evening of July 6 through July 7, 2017, leading to exceedances of the 2008 8-hour O₃ NAAQS at nine air monitoring sites on July 7, 2017.¹²

Based on the information described above, the demonstration submitted by ADEQ meets the narrative conceptual model criterion of the EER.

Table 2: Documentation of Narrative Conceptual Model

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 7, 2017	Section II: p 6-34	Sufficient	Yes

¹⁰ See demonstration, p. 10-12.

¹¹ See demonstration, p. 13-29.

¹² See demonstration, p. 13, 30-34.

Clear Causal Relationship

The demonstration included several analyses to support a clear causal relationship between the wildfire event and the monitored exceedances. These analyses are presented in Section III of the demonstration.

Comparison with historical concentrations

The demonstration included a comparison with historical concentrations, as required by 40 CFR 50.14(c)(3)(iv)(C).¹³ The demonstration compared the event-related O₃ concentrations with all April through October concentrations from 2013-2017. The plots provided show that daily maximum 8-hour average O₃ concentrations on July 7, 2017 were at or above the 5-year 99th percentile value for every exceeding monitor except for Mesa and Pinnacle Peak, which had concentrations below the 99th percentile. The Mesa concentration was the fourth highest daily maximum 8-hour average O₃ concentration in 2017, and the Pinnacle Peak concentration was the second highest daily maximum 8-hour average O₃ concentration in 2017. Notably, the Dysart concentration was the highest ever daily maximum 8-hour average O₃ concentration recorded since monitoring began in 2003, at 13 ppb higher than the 99th percentile and 4 ppb higher than ever recorded since monitoring began at the site in 2003.

Tier 1: Key Factor

To meet the key factor for a Tier 1 analysis, exceedances should be clearly higher than other non-event related exceedances, or occur during a time of year that typically experiences no exceedances. The event-related exceedances identified in this demonstration occurred during the regular O₃ season, during times when other exceedances similar in magnitude were measured for most of the monitors (with the exception of the Dysart monitor, which measured unusually high concentrations as previously noted). Therefore, most of the event exceedances do not meet the Tier 1 Key Factor, and additional evidence beyond a Tier 1 analysis is needed to support the clear causal relationship.

Tier 2: Key Factors

The demonstration included an evaluation of the Tier 2 Key Factors. For Tier 2 Key Factor 1, the demonstration provided an analysis of fire emissions (Q) and distance (D) of the wildfires to the monitoring site locations.¹⁴ Q was calculated from emissions during July 5-7, 2017 for the Burro, Crack Tank, Elk Horn, Frye, Hilltop, SH Creek, and Sheep fires, using perimeter growth and BlueSky Playground.¹⁵ The demonstration stated that emissions were considered over these three days, since emissions from wildfires can accumulate over time to produce O₃ and O₃ precursors. On this basis, a Q equal to the sum of fire emissions over three days was used, as opposed to a single day as described in the EPA's wildfire O₃ guidance document. The distance D from each fire to the Phoenix Supersite monitor, which is somewhat centrally located within the nonattainment area, was calculated. Using these values, Q/D was determined for each individual fire, as well as a direct sum and a distance-weighted sum of Q/D for all fires in the area. The distance-weighted sum is 21.09 tons of NO_x and VOC over the three days per km, which is well

¹³ See demonstration, p. 35-46.

¹⁴ See demonstration, p. 47-48.

¹⁵ U.S. Forest Service's BlueSky Playground, available at <https://tools.airfire.org/playground/>.

below the Tier 2 Key Factor 1 screening value of 100 tons per day/km. Therefore, the event exceedances do not meet Tier 2 Key Factor 1.

For Tier 2 Key Factor 2, the demonstration included evidence that the exceedances are at or above the 99th percentile from the past five years of O₃ season data (April-October 2013-2017) or were among the four highest concentrations measured at the site in 2017.¹⁶ All but two of the monitors had event concentrations at or above the 99th percentile for the 5-year period while two monitors (Pinnacle Peak and Mesa) did not. However, the event concentration at Pinnacle Peak was the second highest O₃ concentration measured at the site in 2017, and the event concentration at Mesa was the fourth highest concentration measured at the site in 2017. Therefore, the event exceedances meet Tier 2 Key Factor 2.

Based on the analysis of the Key Factors for Tier 2, the EPA's wildfire O₃ guidance document indicates that a Tier 3 analysis is appropriate for this event. As described below, the demonstration included the required elements for a Tier 3 clear causal relationship analysis based on the EPA's wildfire O₃ guidance document. This includes evidence to support that (1) wildfire emissions were transported from the wildfire to the monitor; (2) wildfire emissions affected the monitor; and (3) wildfire emissions caused the O₃ exceedances.

Evidence of transport of wildfire emissions from the wildfire to the monitor

The demonstration presented a trajectory analysis using the HYSPLIT model to show transport from the fires to the exceeding monitors.¹⁷ The analysis included 24-hour back trajectories from each of the nine exceeding monitoring sites at 100, 500, and 1500 meters elevation, which were plotted on maps with the monitor and fire locations. The trajectories were run from 4:00PM local time on July 7, 2017, to correspond approximately with the hour of peak O₃ concentration. The individual trajectories vary by monitor and height, but generally show transport from areas southeast of the nonattainment area, where the fires are located. All exceeding monitors show at least one trajectory passing over or near at least one of the fires with the highest emissions on July 5-7, 2017. Generally, the 1500-meter trajectories are more consistent with transport from the Hilltop and SH Creek fires directly east of the nonattainment area, while the lower trajectories are more consistent with transport from the Frye, Sheep, and Burro fires to the southeast, although this varies by monitor.

The demonstration also included satellite imagery, as well as National Oceanic and Atmospheric Administration (NOAA) smoke maps, showing light smoke over much of the Phoenix nonattainment area on July 7, 2017.¹⁸ The EPA's wildfire O₃ guidance document suggests that to show transport, satellite imagery should be accompanied by evidence of the plume reaching the ground. The demonstration stated that the increased O₃ concentrations, coincident with the smoke observed by satellite, demonstrated that smoke reached the ground.¹⁹ The demonstration also included photos from visibility cameras to show reduced visibility on July 7, 2017, as well as diurnal, ground level concentrations of O₃, nitrogen dioxide (NO₂), particulate matter 2.5 microns or less in diameter (PM_{2.5}), and carbon monoxide (CO) (along with a comparison to

¹⁶ See demonstration, p. 37-45, 49.

¹⁷ See demonstration, p. 49-59.

¹⁸ See demonstration, p. 20-29, 50, 60-69.

¹⁹ See demonstration, p. 50.

historical concentrations, as discussed in the following section) to support that smoke reached the ground on July 7, 2017.²⁰

Overall, the trajectory analysis and satellite imagery with evidence of smoke reaching the ground show that emissions from the fires in southeastern Arizona were transported to the nonattainment area and monitoring sites within on July 7, 2017.

Evidence that the wildfire emissions affected the monitor

The demonstration provided diurnal profiles of O₃, NO₂, PM_{2.5}, and CO from the West Phoenix monitor on July 6-8, 2017, along with the 5th, 50th, and 95th historical percentile concentrations of the respective pollutants for each hour by day of week, based on five years of concentrations measured in July at the site.²¹ West Phoenix was chosen as it was one of two sites that had all four measurements in the same location, and CO data from the other site with all four measurements (Phoenix Supersite) was unavailable for the hours leading up to and during the event. Similar analyses were provided, as available, for monitors at the other sites that exceeded the O₃ NAAQS on July 7, 2017 in Appendix F. The data from the West Phoenix site show that NO₂, PM_{2.5}, and to a lesser extent CO were generally elevated relative to the percentile values for each hour, between approximately 7:00PM on July 6 and 10:00AM on July 7, 2017. During much of this time, likely due to scavenging by the elevated NO_x, O₃ concentrations were similarly decreased relative to the percentile concentrations, at some points falling below the 5th percentile line. Starting at approximately 8:00AM, O₃ concentrations steeply increased, rising to near or above the 95th percentile line for many hours throughout the afternoon. ADEQ indicates that the coincident increases in CO, NO₂, and PM_{2.5} concentrations demonstrate that wildfire emissions were transported to the nonattainment area and affected monitors overnight between July 6 and July 7, 2017, and the increase in precursor concentrations (particularly NO_x) from the presence of wildfire smoke contributed to the increased O₃ production on July 7, 2017.

Overall, the coincident increases of pollutants associated with wildfire smoke (CO, PM_{2.5}, and NO₂) and responses in O₃ concentrations provide some evidence that wildfire emissions reached the ground and affected monitors within the nonattainment area on July 7, 2017.

Additional evidence that the wildfire emissions caused the O₃ exceedance

The demonstration included additional evidence to support that the wildfire emissions specifically affected O₃ concentrations at the nine exceeding monitoring sites and caused the O₃ exceedances. A matching day analysis was provided, which included two evaluations: first, an examination of days in July of 2013 through 2017 with similar meteorological conditions to July 7, 2017, and second, an examination of the meteorological conditions and precursor pollutant concentrations of all (non-event) exceedance days in July of 2013 through 2017.²²

The analysis for days with similar meteorological conditions identified five matching days based on resultant wind directions, resultant wind speed, average wind speed, maximum temperature, and the exclusion of days with significant weather events (e.g. large dust storms, heavy rain). As July 7, 2017 experienced a record-setting maximum temperature, identifying days with high

²⁰ See demonstration, p. 70-83.

²¹ See demonstration, p. 77-83.

²² See demonstration, p. 84-101.

maximum temperature was prioritized, as well as resultant wind direction. Of the five matching days selected, four of the days did not record exceedances of the 2008 O₃ NAAQS at any of the monitors that exceeded on July 7, 2017, and several of those days measured concentrations across the network that were well below the NAAQS. On the fifth day, July 8, 2013, exceedances were recorded at four of the nine monitors that exceeded on July 7, 2017. The demonstration noted that some screening tools and elevated PM_{2.5} concentrations suggested that July 8, 2013 could also have been influenced by wildfire emissions. This day was further discussed in the second matching day evaluation. Overall, the demonstration concluded that the first matching day analysis showed that the July 7, 2017 O₃ concentrations were unusual compared to days with similar meteorology, which generally did not result in exceedances of the 8-hour 2008 O₃ NAAQS.

The analysis of monitored non-event exceedance days identified 13 other exceedance days, besides the event day, in July of 2013 through 2017 where exceedances of the 2008 O₃ NAAQS occurred at one or more of the nine monitors that exceeded on July 7, 2017. Nine of these days experienced exceedances at two or fewer of the nine monitoring sites. The remaining four days experienced exceedances at four to seven of the nine monitoring sites and were considered most similar to the July 7, 2017 exceedance patterns. The demonstration included an assessment of O₃, NO₂, CO, and PM_{2.5} concentrations on and around these four days (which included the July 8, 2013 exceedance day identified in the first matching day analysis) to identify potential differences between the four non-event exceedance days and the claimed event exceedance day. For all four non-event exceedances, hourly daytime O₃ concentrations on the day preceding the exceedance day were at or near the 95th percentile, suggesting that these four exceedance days resulted from a buildup of O₃ from the previous day or days. In contrast, the day before the event exceedance day, hourly daytime O₃ concentrations were around the 50th percentile; concentrations jumped dramatically to the July 7, 2017 exceedance, which was the highest exceedance measured over the five-year period from 2013 through 2017 at five of the nine monitors.

The analysis also showed that PM_{2.5}, NO₂, and CO were all elevated in the hours before the July 7, 2017 exceedance, suggesting that smoke and O₃ precursors were present and affected O₃ concentrations in the nonattainment area, as previously discussed. On the other four exceedance days, these other pollutants were generally not elevated to the same degree as on July 7, 2017; PM_{2.5} was elevated on the day preceding the July 8, 2013 exceedance, which may suggest that this exceedance day could have been influenced by wildfire smoke as well, but was not elevated on the exceedance day itself. Overall, this evidence suggests that the concentrations on the non-event exceedance days were likely not influenced by wildfire smoke, and that these days instead likely resulted from accumulation of O₃ within the nonattainment area over multiple days, whereas the July 7, 2017 exceedance was preceded and followed by generally low O₃ concentrations. The uniqueness of the July 7, 2017 exceedance in comparison to other exceedances also supports a clear causal relationship between the wildfire emissions and the exceedances on that day.

The analyses included in the demonstration, specifically, the comparison with historical daily maximum 8-hour average O₃ concentrations, HYSPLIT trajectory analyses, satellite imagery of smoke, diurnal concentrations of O₃, increases in other pollutants typically associated with

wildfire emissions including PM_{2.5}, CO, and NO₂, and matching day analyses, sufficiently demonstrate a clear causal relationship between the emissions generated by the wildfire emissions in southeastern Arizona and the exceedances measured at the Central Phoenix, Dysart, Glendale, Mesa, North Phoenix, Phoenix Supersite, Pinnacle Peak, South Phoenix, and West Phoenix monitoring sites.

Table 3: Documentation of Clear Causal Relationship

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 7, 2017	Section II: p. 20-29 Section III: p. 35-101	Sufficient	Yes

Not Reasonably Controllable or Preventable

The EER presumes that wildfire events on wildland are not generally reasonable to control or prevent. The demonstration provided evidence that the wildfire event meets definition of a wildfire. Specifically, the demonstration states that "...[b]ased on the documentation provided in Section II of this submittal, the event meets the definition of a wildfire, as the southeastern Arizona wildfires were all located on wildlands."²³ Therefore, the documentation provided sufficiently demonstrates that the event was not reasonably controllable and not reasonably preventable.

Table 4: Documentation of Not Reasonably Controllable or Preventable

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 7, 2017	Section I: p. 10-12, Section IV: p. 102	Sufficient	Yes

Natural Event

The definition of "wildfire" at 40 CFR 50.1(n) states, "A wildfire that predominantly occurs on wildland is a natural event." The demonstration includes documentation that the event meets the definition of a wildfire and occurred predominantly on wildland, and has therefore shown that the event was a natural event.

Table 5: Documentation of Natural Event

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 7, 2017	Section I: p. 10-12, Section IV: p. 102	Sufficient	Yes

Schedule and Procedural Requirements

In addition to technical demonstration requirements, 40 CFR 50.14(c) and 40 CFR 51.930 specify schedule and procedural requirements an air agency must follow to request data exclusion. Table 6 outlines the EPA's evaluation of these requirements.

²³ See demonstration, p. 102.

Table 6: Schedules and Procedural Criteria

	Reference	Demonstration Citation	Criterion Met?
Did the agency provide prompt public notification of the event?	40 CFR 50.14 (c)(1)(i)	Section I: p 3, Appendix A	Yes
Did the agency submit an Initial Notification of Potential Exceptional Event and flag the affected data in the EPA's Air Quality System (AQS)?	40 CFR 50.14 (c)(2)(i)	Section I: p. 3-4, Appendix E	Yes
Did the initial notification and demonstration submittals meet the deadlines for data influenced by exceptional events for use in initial area designations, if applicable? Or the deadlines established by the EPA during the Initial Notification of Potential Exceptional Events process, if applicable?	40 CFR 50.14 Table 2 40 CFR 50.14 (c)(2)(i)(B)	Section I: p. 3-4, Appendix E; May 8, 2018 Letter ²⁴	Yes
Was the public comment process followed and documented? <ul style="list-style-type: none"> • Did the agency document that the comment period was open for a minimum of 30 days? • Did the agency submit to the EPA any public comments received? • Did the state address comments disputing or contradicting factual evidence provided in the demonstration? 	40 CFR 50.14 (c)(3)(v)	Section I: p. 4, Appendix D; July 17, 2018 Letter ²⁵	Yes
Has the agency met requirements regarding submission of a mitigation plan, if applicable?	40 CFR 51.930 (b)	NA	NA

Conclusion

The EPA has reviewed the documentation provided by ADEQ to support claims that smoke from wildfires in southeastern Arizona caused exceedances of the 2008 8-hour O₃ NAAQS at the Central Phoenix, Dysart, Glendale, Mesa, North Phoenix, Phoenix Supersite, Pinnacle Peak, South Phoenix, and West Phoenix monitoring sites on July 7, 2017. The EPA has determined that the flagged exceedances at these monitoring sites on this day satisfy the exceptional event criteria: the event was a natural event, which affected air quality in such a way that there exists a clear causal relationship between the event and the monitored exceedance, and was not reasonably controllable or preventable. The EPA has also determined that ADEQ has satisfied the procedural requirements for data exclusion.

²⁴ See letter from Gwen Yoshimura, EPA Region 9, to Timothy Franquist, ADEQ, dated May 8, 2018.

²⁵ See letter from Timothy Franquist, ADEQ, to Michael Stoker, EPA Region 9, dated July 17, 2018.